1. High compression ratio, homogeneous charge compression ignition/spark ignition dual mode engine comprising:

a first mode employing homogeneous charge compression ignition at low- and mid-load levels; and

a second mode employing spark ignition at high load levels, the second mode including the addition of hydrogen or a hydrogen/carbon monoxide mixture in the engine.

2. The engine of claim 1 wherein the compression ratio is greater than about 10:1.

3. The engine of claim 1 operating on a low octane gasoline.

4. The engine of claim 1 wherein the addition of hydrogen or a hydrogen/carbon monoxide mixture is sufficient to prevent knock.

5. The engine of claim 1 wherein the addition of hydrogen or a hydrogen/carbon monoxide mixture increases the fuel octane number by at least 10.

6. The engine of claim 1 further including control means for changing engine mode.

7. The engine of claim 1 wherein the engine operates on a very lean fuel-air mixture or at a stoichiometric fuel-air mixture with high EGR.

8. The engine of claim 1 further including pressure boosting to increase engine power density.

9. The engine of claim 8 wherein pressure boosting is by turbocharging or supercharging.

10. The engine of claim 1 wherein the hydrogen or hydrogen/carbon monoxide mixture is produced by a hydrocarbon fuel reformer.

11. The engine of claim 10 wherein the fuel reformer is a plasmatron reformer.

12. The engine of claim 1 wherein the hydrogen is stored in a high pressure vessel or other onboard storage means.

13. The engine of claim 1 further including means for varying combustion rate by stratifying the hydrogen or the hydrogen/carbon monoxide mixture.

14. The engine of claim 13 wherein stratifying the hydrogen or hydrogen/carbon monoxide mixture is achieved through non-uniform or time-varying port fueling or by in-cylinder injection.

15. The engine of claim 1 further including means for slowing down the combustion process to reduce acoustic noise.

16. The engine of claim 1 wherein the amount of the hydrogen or the hydrogen/carbon monoxide mixture is increased as engine load increases.

17. High compression ratio, homogeneous charge compression ignition engine operating on a high cetane fuel along with the addition of hydrogen or a hydrogen/carbon monoxide mixture at low-to-mid-load levels.

18. The engine of claim 17 wherein the high cetane fuel is diesel fuel.

19. The engine of claim 17 wherein the ratio of hydrogen or a hydrogen/carbon monoxide mixture to the high cetane fuel is reduced at high load levels and the engine operates in compression ignition mode.

20. The engine of claim 17 wherein the ratio of hydrogen or a hydrogen/carbon monoxide mixture to the high cetane fuel is varied to achieve a selected ignition delay.

21. The engine of claim 17 further including control means for changing engine mode.

22. The engine of claim 17 further including pressure boosting to increase engine power density.

23. The engine of claim 12 wherein the power boosting is by turbocharging or supercharging.

24. The engine of claim 17 wherein hydrogen or hydrogen/carbon monoxide mixture is produced by a hydrocarbon fuel reformer.

25. The engine of claim 24 wherein the fuel reformer is a plasmatron.

26. The engine of claim 17 wherein the hydrogen or hydrogen/carbon monoxide mixture is contained in a high-pressure vessel or other onboard storage means.

27. The engine of claim 17 wherein the high cetane fuel is bio-oil.